European space manufacturing industry turnover was €4.4 billion, with a workforce of 28,000 people. One clear conclusion from examining European Earth observation is that a stronger policy and legal basis is now being developed to underpin the high quality scientific and technology base.

The European Union through the European Commission sees a role for itself in providing clearer regulation or at least harmonisation in how digital data, including Earth observation data, are treated. The European Commission, the European Space Agency, and the member states have invested in GMES to provide Earth observation information to support environmental and civil security projects and, in the process, contributed positively to the development of the ideas that saw the birth of the Group on Earth Observation and its global organisation at high political levels.

It is highly likely that in Europe there will continue to be a strengthening of the policy and legal dimensions to space, not least when Earth observation technology takes substantial steps beyond research and into operational and commercial systems.

IMPROVEMENT TO THE LEGAL REGIME FOR THE EFFECTIVE USE OF SATELLITE REMOTE SENSING DATA FOR DISASTER MANAGEMENT AND PROTECTION OF THE ENVIRONMENT

Atsuyo Ito[*]

ABSTRACT

Satellite remote sensing is increasingly used to assist critical decision making related to disaster management and protection of the environment. However, the current legal environment surrounding remote sensing from space is not regulated sufficiently and is full of uncertainties. Particularly, the issues of data policies and liability are not well addressed and restrict the widespread use and realization of the full benefits of this powerful tool. There is an urgent need for clarification as well as a more comprehensive regime. The aim of this paper is to examine the current legal framework surrounding remote sensing, identify the shortcomings of the current regime, examine the issues, and then propose improvements to the current regime.

INTRODUCTION

More than ever before, human beings are now exposed to the degradation of environment and are vulnerable to the risks of natural disasters. On the other hand, our capability to deal with such risks has broadened and enhanced, thanks to the state-of-art technologies. Remote sensing by Earth observation satellites is increasingly recognized as a vital tool to gain better understanding of ever-changing natural phenomena. It enables more effective response to disasters and allows us to better cope

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with environmental problems. Not only is it well suited for the assessment and mitigation of risks, but it also appropriate for the verification of a range of international treaties including claims related to environmental protection. It is becoming a significant source of information to assist critical decision making.

Following the Indian Ocean tsunami, a number of satellite images were used to assess the location and the extent of the devastation, target relief services, and aid agencies most effectively by comparing these images with those taken before the tsunami. Remote sensing data has also been used for a number of environmental applications including oil spill monitoring and assessment of a rate and extent of deforestation of the Amazon.

The use of the remote sensing for such purposes is governed by international space law; however, there are issues, particularly with respect to supply and the use of data, which are not addressed sufficiently under the current legal framework.

Concrete problems lie in the inadequacy of the existing regime regarding two points. First, divergent data policies are commonly set by the different entities. Second, there is currently an ambiguity over the responsibility and liability arising from supply and/or use and misuse of the data and resulting products. These create obstacles for protecting the balanced interests of all parties concerned in the generation, supply, and use of the remote sensing data.

Users may be hampered from accessing and sharing data effectively as a result of the restrictive access and pricing policy. Users as well as third parties face the risk of damage arising from incorrect data. On the other hand, data suppliers may face uncertainties with regard to securing their rights associated with the data including intellectual property rights, and they bear the liability risks arising from the data.

The uncertain legal environment surrounding remote sensing from space is thus restricting the widespread use and realization of the full benefits of this powerful tool. Hence, there is an urgent need for clarification as well as a more comprehensive regime. This paper examines the legal framework surrounding remote sensing, identifies the shortcomings, examines the issues in depth, and finally provides recommendations to the current regime.

I. THE CURRENT LEGAL FRAMEWORK SURROUNDING REMOTE SENSING

The current international regime governing outer space and remote sensing from space consists of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,[1] and the 1986 Principles Relating to Remote Sensing of the Earth from Outer Space.[2] These documents endorse the principles governing outer space and the fundamental rules in conducting remote sensing from space. The Outer Space Treaty establishes clearly that sovereignty does not extend to outer space[3] and that outer space is free for use by all countries.[4] The treaty also states, however, that there is a general State responsibility in conducting such activities,[5] which could result in international liability for damage caused to other States.[6] This point was elaborated on further in the 1972 Convention on International Liability for Damage Caused by Space Objects.[7] The U.N. Remote Sensing Principles, international legislation dedicated to remote sensing activities, establish the legality of sensing from space and data availability in a non-discriminatory manner to all States.[8]

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[1] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Oct. 27, 1967, 610 U.N.TS 205 [hereinafter Outer Space Treaty].

[2] Principles Relating to Remote Sensing of the Earth from Outer Space. G.A. Res. 41/65, U.N. Doc. A/RES/41/65 (Dec. 3, 1986) [hereinafter U.N. Remote Sensing Principles]. This resolution is considered to reflect a customary law that is binding on nations. *See* Joanne Irene Gabrynowicz, *Expanding Global Remote Sensing Services*, *in* PROC. OF THE WORKSHOP ON SPACE LAW IN THE TWENTY-FIRST CENTURY 101 New York (2000).

[3] *See* Outer Space Treaty, *supra* note 1, at art. II.

[4] *Id.* at art. I.

[5] *Id.* at art. VI. Article VI of Outer Space Treaty establishes the States Responsibility for space activities conducted either by governmental agencies and non-governmental agencies.

[6] *Id.* at art. VII.

[7] Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T 2389, T.I.A.S No. 7762 [hereinafter Liability Convention].

[8] Principle IV of U.N. Remote Sensing Principles stipulates that, "[r]emote sensing activities shall be conducted in accordance with the Art. I of the Outer Space Treaty," which establishes freedom of exploration and use of outer space. U.N. Remote Sensing Principles, *supra* note 2, at princ. IV.

On the other hand, the current regime is inadequate to address the critical legal issues arising from remote sensing. The primary focus of the U.N. Remote Sensing Principles is on the debate of rights and duties of sensing States and sensed States which reflects the situation more than two decades ago. Furthermore, the principles focus mainly on the rules concerning data collection and dissemination, but not the supply, use, and application of the data. The U.N. principles do not sufficiently regulate the current environment surrounding remote sensing activities that have changed dramatically since 1986.

Currently, a number of nations[9] as well as private entities[10] have sensing capabilities, and data distribution takes place on a more commercial basis. Indeed, there are more and more non-State actors including data generators, processing wholesalers, and value added entities.[11] These non-State actors are involved in data collection and data handing operations. Likewise, users have diversified and increased in numbers; nowadays users can range from aid agencies, U.N. organizations, universities, media, insurance companies, to any individual that can afford the data. Data is used for a variety of purposes including damage and impact assessment, verification of insurance claims, environmental studies, and map making. Whatever the uses, they have a critical impact upon the end-users as well as on third parties. It is critical to clarify the current rules associated with the supply and use of the data and identify shortcomings that need rectification. Let us now examine how the provisions of the current regime are insufficient and raise the specific issues.

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[9] Nations include Algeria, Brazil, Canada, China, Columbia, France, India, Italy, Japan, Korea, Nigeria, Taiwan, Turkey, U.K., U.S.A., and Russia. *See* Joanne I. Gabrynowicz, *The Land Remote Sensing Laws and Policies of National Governments: A Global Survey* (National Remote Sensing, Air & Space Law Center, Jan. 3, 2007), *available at* http://www.spacelaw.olemiss.edu/activitiesandevents/2007/RS%20Law%20Global%20Survey.pdf.

[10] Entities include GeoEye, Digital Globe, and ImageSat International.

[11] Entities include SERTIT, GAF, Digitech International, Infoterra, Euromap, and Eurimage.

II. IDENTIFICATION OF THE PROBLEMS

As mentioned previously, the U.N. Remote Sensing Principles establish the fundamental rule regarding data collection. Principle IV, stipulating that "remote sensing activities shall be conducted in accordance with Article I of the Outer Space Treaty," established the freedom of exploration and use of outer space and legitimatised remote sensing from space by all of the States. Later, it mentions the sovereign rights of the sensing States;[12] however, it is not explicit as to the conditions for sensing from space in terms of respecting the rights of sensing States. Hence, the data collection policy provides: 1) no restrictions based on geography; objects observed including natural resources and the sea surface; and, territories beyond national jurisdiction; 2) no prior consent, consultation, or notification is required before sensing; therefore, no veto right is granted to the sensed States with regard to their territories being sensed;[13] 3) no conditions are imposed for sensing capabilities with varying degrees of the spatial resolution, or type of sensor such as radar or optical.

However, as to the access, distribution, and use of data, the principle is not sufficient to address issues concerning data availability and accessibility or the rights of data generators associated with the data. Principle XII is the only provision that refers to the issue of data policy. Principle XII stipulates that "as soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed State shall also have access to them on a *non-discriminatory basis* and *on reasonable cost terms.*" (Emphasis added.) Common interpretation of "non-discriminatory basis" is that the sensing States have an obligation to provide the data to the sensed States under the same conditions as other States that

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[12] Principle VI states that, "[t]hese activities shall be conducted on the basis of respect for the principle of sovereignty of all States, and peoples over their own wealth and natural resources", and "[r]emote sensing activities shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed States". U.N. Remote Sensing Principles, *supra* note 2, at princ. VI.

[13] Frans Von Der Dunk, *United Nations Principles on Remote Sensing and the User, in* EARTH OBSERVATION DATA POLICY AND EUROPE 33 (Ray Harris, ed., 2002).

wish to access the data. Hence, no distinctions are made as to data use for different purposes as well as different types of users.

Furthermore, the provision "reasonable cost terms" is ambiguous and open to different interpretations. It is not defined under the U.N. Remote Sensing Principles; it could mean marginal costs or market price in so far as it is reasonable for the particular data in question. It in no way serves as a general guideline for price settings expected for different types of products or for uses by the divergent data generators. Although Principles X and XI encourage the disclosure of information for the purpose of environmental protection and disaster management,[14] they do not concretely state on what terms the data should be supplied in such cases. Therefore, they do not serve as a legal basis to allow data use and sharing for public benefit purposes at favorable conditions.

The U.N. Principles are completely silent on the rights of data generators associated with data such as intellectual property rights and conditions for the use of data. The principles do not serve as an international guideline to govern activities of data suppliers or recipients. Consequently, data access, distribution, and use are governed largely by data policies that an individual supplier sets. This specifically raises issues as to the accessibility of data, as well as rights associated with data not ensured by all parties concerned.

In turn, the current regime does not sufficiently address responsibility and liability issues. Article VII of the Outer Space Treaty, together with the Liability Convention, establishes international liability of a launching State for the damage caused by a space object or component part incurred on Earth. The Li-

[14] Principle X stipulates that, "States participating in remote sensing activities that have identified information in their possession that is capable of averting any phenomenon harmful to the Earth's natural environment shall disclose such information to States concerned." U.N. Remote Sensing Principles, *supra* note 2, at princ. X. Additionally, Principle XI states that, "States participating in remote sensing activities that have identified processed data and analysed information on their possession that may be useful to States affected by natural disasters, or likely to be affected by impending natural disasters shall transmit such data and information to States concerned as promptly as possible." *Id.* at princ. XI.

ability Convention stipulates that "a launching State shall be absolutely liable for damage caused by its space object on the surface of the Earth or to an aircraft in flight."[15] The most common interpretation of the Liability Convention is that it covers identifiable physical damage directly caused by the space object. It only appears to address liability in cases where a remote sensing satellite falls on the Earth's surface and causes damage.

The Outer Space Treaty and Liability Convention are silent as to the types of damage associated with the satellite remote sensing which are subject to liability. Indeed, one cannot find the types of provisions which would be of help in settling claims, such as responsibility to provide accurate information by remote sensing and/or responsibility not to cause damage to others by use and misuse of remote sensing derived information.

Furthermore, the international responsibility expected of States engaged in the remote sensing activities is ambiguous as to the types of remote sensing activities the responsibility extends to. The scope of the remote sensing activities covered is "the operation of remote sensing space systems, primary data collection and storage stations, and activities in processing, interpreting and disseminating the processed data." From this, it can be interpreted that responsibility extends to data handling activities and distribution, but not likely to the use and application of data.

Lastly, it can be construed that Principle XIV, stating that "States operating remote sensing bear international responsibility for their activities," does not impose the responsibility on end-users or other third parties who use the data. Indeed, the principle limits its extent of liability within the supplier side. Hence, the U.N. Remote Sensing Principles are not comprehensive to cover the responsibilities of all potential defendants or consequential liabilities arising from use and application of data.

In these ways, the present regime neither promotes, nor regulates remote sensing activities. It does not address clearly the rights and obligations of all the potential parties concerned

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[15] Liability Convention, *supra* note 7, at art. II.

in generation, supply, and use of remote sensing data, including data suppliers, recipients, and third parties. It fails to address important commercial and operational aspects, such as data policy issues, including intellectual property rights and responsibility and liability associated with the data.

The legal considerations are undoubtedly beyond the scope of the current regime surrounding remote sensing. The uncertain legal environment surrounding remote sensing from space restricts widespread use and realization of the full benefits of this powerful tool. The inadequacy of the current legal framework needs to be rectified so that remote sensing data can be rigorously and fully exploited with legal power.

III. ISSUES OF DATA POLICIES AND LIABILITIES

Absence of international rules has created a complex legal environment surrounding data supply and use, through a variety of contractual agreements provided by individual data suppliers under the national law governing the respective entity.

1. Data Policies Surrounding Data Supply

Data policies clarify who has access to which data under what conditions. Divergent data policies including access/distribution policies, pricing, conditions for use, and intellectual property rights are set commonly by different suppliers. They affect the degrees of accessibility to and utilization of data for the full benefit of end-users and third parties. Now let us look at the practice of data suppliers with respect to access, distribution and pricing policy, conditions associated with the data, and intellectual property rights respectively.

A. Access and Pricing Policy

The existing data policies adopted by different entities, in terms of access and pricing policy can largely be categorized as two types. Clear distinction is made between governmental agencies and commercial entities that operate satellites and generate data. As far as governmental agencies are concerned, policies appear to be further categorized into two types 1) open

access policies with free or marginal costs pricing, which is the policy adopted by the U.S. and 2) more regulated access policies with categories of uses or users and cost recovery pricing adopted by European entities.

With regard to U.S. governmental agencies, *Landsat* data is available on a non-discriminatory basis at the cost of fulfilling user requests,[16] while *QuickSCAT* data and *MODIS* data are available free of charge for scientific and educational use with few restrictions.[17] The non-U.S. space agencies, including the European Space Agency,[18] adopt two or multiple tier systems to regulate the distribution of their satellites. The data from the latter agencies are provided at marginal cost or free of charge if they are categorized as for "public" use including internal, educational, and research use.[19] Data is provided free of charge for humanitarian needs to assist aid agencies in disaster relief within certain frameworks such as the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters.[20] Data categorized as commercial use is distributed to the end-users by their data distributors on a commercial basis.

Private entities operating remote sensing systems, such as Digital Globe and GeoEye, distribute their data on a purely

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[16] Land Remote Sensing Policy Act of 1992, 15 U.S.C. § 5601, § 5615.

[17] Ray Harris, *Data Policy Assessment for GMES Final Report*, at 38 (University College London, Department of Geography, 2004), *available at* www.ucl.ac.uk/laws/environment/satellites/docs/DPAGFR(v2).pdf.

[18] ESA for instance, with respect to *ENVISAT*, distinguishes between category 1 and 2 use where category-1 is for research and application development use, and where category-2 is for other uses including operational and commercial use. *See* Envisat Data Policy, ESA/PB-EO (97) 57, rev 3 (hereinafter Envisat Data Policy). For *ERS*, there are five categories, namely: A-internal use; B- research and demonstration use; C-national meteorological services belonging to WMO members; D-those organizations of participating states engaged in operational services for public utility; and E-Commercial use. *See* Principles of the Provision of ERS Data to Users, ESA/PB-EO (97) 57, rev. 6 (Paris, May 9, 1994).

[19] *See* Principles of the Provision of *ERS* Data to Users, ESA/PB-EO (90) 57, rev. 6, Paris, 9 May 1994, (European Space Agency, Earth Observation Programme Board). Principles of the Provision of *ERS* data to users state free of charge for category A and cost of fulfilling user request for category B. For *ENVISAT*, it is at or near the cost of reproduction of the data for category 1. *See* Envisat Data Policy, *supra* note 18.

[20] Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, Rev.3 (25/4/2000).2 (2000) [hereinafter Disasters Charter], available at http://www.disasterscharter.org/main_e.html.

commercial basis. The commercial data generators hold a single category of commercial users unless a special arrangement is made such as the aforementioned Disasters Charter.[21]

The distinction appears to be that U.S. governmental data are normally available at no cost or marginal cost for all users, whereas data from non-U.S. agencies reserve certain capacity for public use and distribute the remaining data at no cost or marginal cost. Private entities allow such data distribution special treatment.

B. Conditions for Use of Data

The practice of most data generators is that data supply and use is regulated through agreements with respect to end-users. They do not sell their data away, but issue licenses to use their products under conditions they set, and retain control over data through such licenses.

With respect to licensing agreements, the data generator imposes various conditions on data recipients associated with the data. The overall tendency is that they prohibit reproduction other than for backup purposes, further distribution of products to third parties, sales of products, and sub-license without authorization.[22] These conditions are not uniform and can vary depending on the data supplier.

Let us closely look at the conditions for further distribution. Generally, licensees are allowed to let their sub-contractors use data on behalf of licensees, but are not allowed to share data with the other entities without authorization.[23] Data suppliers often charge higher in case of multiple users sharing the same

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[21] Digital Globe and GeoEye, represented by U.S. Geological Survey (USGS), have joined the partners of the International Charter on Space and Major Disasters. *See* Press Release, International Charter, Space and Major Disasters (April 12, 2007), *available at* http://www.disasterscharter.org/press/press20070413_e.html.

[22] See, for instance, data policies of EROS, Disaster Monitoring Constellation International Imaging(DMCII), and Spot Image.

[23] For instance, in the case of Digital Globe, end users can share the data with affiliated entities only if they agree to be bound by the conditions of the license and images and derived products may not be retained by affiliated entities.

data.[24] Hence, end-users' sharing of data is mostly discouraged and restricted. This creates hurdles for critical knowledge sharing derived from the satellite among the relevant communities for effective disaster preparation and response as well as for environmental agencies in need of certain data sets for different projects. Establishing data policies to allow effective data sharing will rationalize and enhance data use for public services.

C. Intellectual Property Rights Associated with Data

In terms of the intellectual property rights, the current practice is that the ownership of data stays with data generators and the copyright is claimed by the majority of data generators with some exceptions among the US governmental satellites including *Landsat 7*, *MODIS* and *NOAA-17*.[25]

Complications arise as each data supplier is bound by the intellectual property law of the nation whose jurisdiction covers the data supplier. The intellectual property right of copyright is applied to expressions in literary and artistic work[26] and raises uncertainties for application to satellite images whatever the jurisdiction. Many national laws require certain degrees of human intellectual intervention and hence it is particularly questionable as to whether they apply to raw data and processed data.[27]

While a copyright is likely to be applicable to value added products that involve intellectual creation,[28] the data policies by those claiming copyright for their products are generally ambiguous as to the types of products that are subject to protection. This implies that whatever degree of data handling activi-

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[24] Geo Eye, Spot Image and DMCII levy higher charges for the multiple uses depending on number of entities sharing their products.

[25] Ray Harris, *Legal Approaches: Contractual and Regulatory; the European Commission Directive*, *in* PROC. OF THE INTERNATIONAL CONFERENCE; SATELLITE REMOTE SENSING IN AID OF DEVELOPMENT: LEGAL CONSIDERATIONS, at 37 (Tunis, Sept. 26-27, 2002).

[26] Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, 1161 U.N.T.S. 3.

[27] Martha Mejia-Kaiser, *Satellite Remote Sensing Data in Databases Copyright or sui generis Protection in Europe?* XXII-I ANNALS OF AIR & SPACE L. 496 (1997).

[28] See, for instance, copyright recognized for a map that involves intellectual inputs in *Mason v. Montgomery Data Inc.*, 967 F. 2d 135 (5th Cir. 1992).

ties are involved in the products, a copyright may still be held by data generators. The exception appears to be the *Advanced Land Observing Satellite* (*ALOS*). Its license agreement explicitly states that the copyright for highly value added products rests with persons that conducted value added operations.[29] Looking at satellite derived maps and other value added products delivered under the framework of the Disasters Charter, one will find value added entities are credited but not copyrighted. It can be argued that under the current practice, the rights of value added entities over the value added products derived from satellite images are not safeguarded properly. It implies that the value added entities would not be able to pursue their claims independently when there has been a copyright infringement of value added products. There appears to be a gap between the intentions of the data generator seeking protection for whatever the types of products and the regime for copyright applicable to the author's original expressions that supports the copyright protection value added entities more than the data generators that have invested in the development and operation of the remote sensing systems.

These uncertainties affect all concerned parties associated with the data due to the cross border nature of data generation, supply, and use. In these ways, the data policies need to be clarified in order to ensure easier access as well as to safeguard the rights of the all concerned parties in the supply chain.

2. The Uncertain Liability

The current ambiguity over responsibility and liability is a major problem as the risks for damage and liability are conceivable, and consequences thereof can be detrimental.

The damages can arise from relying on inaccurate data and/or misuse of data. There have been a number of instances involving misinterpretation and misuse of data in the past. For example, the media misinterpreted satellite imagery and aired incorrect information to the public following the 1986 Chernobyl

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[29] *See* ALOS End User License Agreement, at art. 4.2, *available at* http://www.alos-restec.ip/pdf/ALOS.

accident by announcing that two reactors were on fire instead of one.[30]

There has also been a case involving an intentional misrepresentation of data in Kansas. The U.S. Postal Inspection Service brought fraud charges against Psytep Corp. for giving Kansas authorities satellite imagery that turned out to be an aerial photograph taken at a time that was irrelevant to the case at issue.[31]

In a case before the International Court of Justice involving Nigeria and Cameroon,[32] Nigeria used a satellite image to prove that Tipsan was located in Nigerian territory. Using the same imagery, however, Cameroon claimed that Tipsan was located in Cameroon's territory.[33]

The above examples are only a few of the conceivable claims. Indeed, any person, either natural or juridical, and/or State is exposed to the risk of liability as well as damage arising from remote sensing data. Data suppliers bear liability risks in cases where the population is affected by disasters or aid workers are injured as a result of inappropriate instructions. On the other hand, users may have potential risks for liability if misuse of data incurs damage to data suppliers or to third parties.

Under the current uncertainty, undesirable results of the existing risks would directly hit the parties concerned when damage occurs. Users may not recover compensation from the loss they incur. As a result, users are less confident when using data for critical decision making that significantly affects either their interests or the third party's. On the other hand, suppliers

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[30] R. Dalbello & L. F. Martinez, *The Legal and Political Implications of Media Newsgathering From Space*, *in* PROCEEDINGS OF THE COLLOQUIUM OF LAW OF OUTER SPACE, at 200 (American Institute of Aeronautics and Astronautics Inc, 1987).

[31] W. Ferester, *Firm Suspected of Misrepresenting Imagery*, SPACE NEWS (Jan. 16, 1995).

[32] In this case, the entire land boundary from Lake Chad in the north Bakassi Peninsula in the south was disputed by the two States, both claiming the village of Tipsan to be in their territory. See The Land and Maritime Boundary Between Cameroon and Nigera (Cameroon v. Nig. Eq. Guinea Intervening), (Judgment of Oct. 10, 2002), *available at* http://www.icj-cij.org./icjwww/idocket/icn/icnjudgment/icn_ijudgment_20021010.pdf

[33] NPA Group, *BNSC Sector Studies, Applications of EO to the legal Sector*, at 73 (Aug. 2001), *available at* www.ucl.ac.uk/laws/environment/satellites/docs/EOdataLegalSector.pdf.

may incur unnecessary litigation costs under uncertain liability. Consequently, it may make data suppliers reluctant to provide data particularly on a voluntary basis.

IV. ISSUES OF LIABILITY: HOW DISPUTES MAY BE ADDRESSED CURRENTLY

At present, if a dispute arises, how it is likely to be addressed under the current regime depends on the setting:

1. Disputes between the parties in contractual relations: data generator/supplier and data recipient, and data generator and their sub-contractor;

2. Disputes between the parties outside contractual relations: between the data supplier and third party, and between the third parties.

1. Approach from Contractual Liability

When damage arises, the liability is dealt with under the terms of the contract in case of 1, the parties in contractual relations. There is no standardization of contractual liability in the field of satellite remote sensing as there is in the field of international air transport.[34] Hence, contractual provisions agreed upon by the disputing parties are likely to be the primary legal basis to settle the claim.

The contractual agreements of data suppliers with respect to end-users are commonly characterized by limited rights granted to data recipients; limited warranty provided the remedies available limited to replacement of a product or refund in case of claims, and liability disclaimer to data recipients as well as to the third party. The liability disclaimers of the data suppliers in distribution agreements generally attempt to waive any potential liability.[35]

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[34] *See* Convention for the Unification of Certain Rules Relating to International Transportation by Air, Oct. 12, 1929, 49 Stat. 3000, 137 L.N.T.S. 11 [hereinafter Warsaw Convention]. The Warsaw Convention deals with liabilities of air carriers with respect to passengers.

[35] An example of the liability disclaimer by Spot Image is, "[i]n no event shall Spot Image, nor anybody having contributed to development and or production and or deliv-

The intention of data suppliers is that the liability of data suppliers for any damage is waived irrespective of fault on the side of the suppliers. The question arises as to whether such exemption clauses are actually enforceable if the action is brought to court. For this it is necessary to look at some cases. In reality the exoneration clauses included in the contract are not always enforceable. It is likely to be enforceable between parties of equal bargaining power as in *McCullagh v. Lane Fox & Partner*,[36] but tends to be not enforceable when an intentional breach of contract or gross negligence occurs as illustrated in *Boucher v. Riner*[37] and in *State Highway Admin. v. Greiner Eng'g Sciences*.[38] Exoneration clauses may not be enforceable against third parties either, as held in the *Ministry of Housing and Local Gov't v. Sharp*[39] and *Lexington v. McDonnell Douglas*.[40] Data generators' intention to exonerate from any potential liability relying on contractual liability disclaimers may fail and generate unnecessary litigation costs in case of lawsuits brought against the data supplier. Looking at these cases invokes the need to clarify enforceability of liability disclaimers in satellite remote sensing.

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ery of the product, be liable for any claim damage or loss incurred by the End-USER, including without limitation indirect, compensatory, consequential, incidental, special, incorporeal or exemplary damages arising out of the use of or inability to use the product, and shall not be subject to legal action in this respect." An example by the Canadian Space Agency states, "[i]n no event shall Canadian Space Agency or anyone else who has been involved in the creation, production, distribution or delivery of the Data, be liable for any damages whatsoever arising out of or resulting from the use of or inability to use the Data or the performance of the Data, storage media or other CSA provided material, whether in an action in contract or tort, including, but not limited to, negligence."

[36] McCullagh v. Lane Fox & Partner, [1996] 1 EGLR 35.

[37] Boucher v. Riner, 68 Md. App. 539, at 543 (1986) Boucher sued Parachute and Fun Inc. after he parachuted into power lines. It was held that contractual waivers cannot shift risks of a party's own wanton, reckless, or gross conduct.

[38] State Highway Admin. v. Greiner Eng'g Sciences, 83 Md. App. 621 (Md. Ct. Spec App., 1990). The court held that an unambiguous no-damage- for –delay clause was enforceable, but noted that exemption clause is not enforceable if the damage is caused by intentional wrongdoing or gross negligence or fraud misrepresentation. *See* STEPHEN GOROVE, CASES ON SPACE LAW TEXTS, COMMENTS AND REFERENCES, at 69, 1996.

[39] Ministry of Housing and Local Gov't v. Sharp, [1970]2 QB 223, [1970]1 All ER 1009.

[40] Lexington v. McDonnell Douglas (May 8, 1992).

The current practice among data generators regarding contracts governing data use by no means properly addresses the potential liabilities concerning the parties in contractual relations, not to mention the liability arising outside the contractual relations. Hence liability needs to be addressed in the broader framework of tort law, which deals with a private or civil wrong or injury to a person or property.

2. Approach from Tort Liability

Currently, the court has great discretion in deciding how to approach a particular claim arising from remote sensing outside of contractual relations. The fundamental question is on what basis the alleged parties should be responsible for damage arising from remote sensing data. For this it is necessary to look at different bases of tort liability, namely, absolute/strict liability and fault-based liability.

A. Absolute/Strict Liability

The absolute/strict liability standard has been applied particularly to dangerous operations and/or those accompanied by high risks of causing direct damage, including death and personal injury. Such operations include those involving nuclear installations,[41] launching space objects[42] and international air transport.[43]

Let us look at the aforementioned Liability Convention as an example of the absolute liability regime. The Convention stipulates that "[a] launching state shall be absolutely liable to pay compensation for the damage caused by its space object on the surface of the Earth or aircraft in flight." It is a victim ori-

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[41] *See* Vienna Convention on Civil Liability for Nuclear Damage, May 21, 1963, 2 I.L.M. 727. *See also,* Paris Convention on Third Party Liability in the Field of Nuclear Energy, July 29, 1960, 956 U.N.T.S. 251.

[42] *See* Liability Convention, *supra* note 7, at art. II. Article II of the Liability Convention stipulates that the "[l]aunching State shall be absolutely liable to pay compensation for the damage caused by its space object on the surface of the earth or to aircraft in flight."

[43] *See* Warsaw Convention, *supra* note 34. *See also*, Convention on Damage caused by Foreign Aircraft to Third Parties on the Surface, Oct. 7, 1952, 310 U.N.T.S 181 [hereinafter Rome Convention].

ented convention which takes into account that launching space objects is an ultra hazardous activity and accidents are easily foreseen, in which case the potential impact thereof is likely to be devastating. Thus, the responsible State parties must compensate if damage is actually caused by their activities irrespective of their fault in causing such damage. Under this absolute/strict liability standard, defendants may be exonerated from liability in only limited circumstances such as contributory negligence on the claimant's side.[44]

With regard to international air transport, the Rome Convention of 1952 stipulates that the operator of an aircraft should be strictly liable for damage caused to third parties as long as the damage is a direct result of the incident.[45] This standard suggests that recoverable damages under the convention are of a direct nature rather than consequential.

Under the strict liability standard, there is no distinction between the cases where the damage resulted from the fault of the operator and cases where the accidents were unforeseeable. If strict liability is applied to the regime of remote sensing, it would be burdensome to the supplier and discourage data suppliers providing data particularly on a voluntary basis.

Applying damage arising from the supply and the use of remote sensing data is not appropriate for three reasons. First, data collection and data handling activities and the use of the products present little risk for damage; second, the conceivable damage arising from remote sensing is consequential rather than direct; and third, the strict liability approach generally does not take the circumstances surrounding the occurrence of damage into account.

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[44] Article VI(1) of the Liability Convention states, "[e]xoneration from absolute liability shall be granted to the extent that a launching state establishes that the damage has resulted either wholly or partially form gross negligence or act or omission done with the intent to cause damage on the part of a claimant State". Liability Convention, *supra* note 7, at art. VI(1).

[45] Article 1 of the Rome Convention states that, "[a]ny person who suffers damage on the surface shall, upon proof only that the damage was caused by an aircraft in flight or by any person or thing falling therefrom, be entitled to compensation as provided by this convention. Nevertheless there shall be no right to compensation if the damage is not a direct consequence of the incident." Rome Convention, *supra* note 43, at art. 1.

2. Fault-based Liability

On the other hand, fault-based liability determines the fault of the alleged party taking into account the circumstances. If we look at cases in the U.K., fault-based liability holds the alleged party liable in case of negligence by taking into account elements including the reasonableness of the alleged party's behavior and foreseeability of the damage.

The foreseeability of the harm is applied to the case to hold the alleged party liable only if the damage was foreseeable. For instance, in *Bolton and Stone*,[46] a ball hit by the defendant went into the highway and injured the plaintiff. The court held that the defendant was not liable because the incident was unforeseeable.

The reasonableness of the defendant's behavior leading to the damage was considered by the court in *Latimer v. AEC Ltd.*,[47] when the plaintiff employee slipped on the floor of a factory after a flood had occurred and injured himself. The court held that the defendant company was not liable because it was not reasonable to expect the company to close the factory.[48]

Furthermore, fault-based liability takes into account the different standards of duty of care depending on the nature of the tortfeasors. Professional liability is invoked for those who claim a special skill and use that skill in a proper manner.[49] In *Hedley Bryne v. Hellers Partners*,[50] and *White v Jones*,[51] the defendant professionals were held to a higher standard of care and therefore held liable for damages despite the fact that the damage was purely economic and consequential.

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[46] Bolton and Stone, [1951] AC 850.

[47] Latimer v. AEC Ltd., [1953]AC 643, [1953] 2 All ER 449, HL.

[48] RICHARD A. BUCKLEY, THE MODERN LAW OF NEGLIGENCE 42 (Butterworths, London, 1999).

[49] S. Hedley & A Grubb (eds.), *Professional Liability*, *in* THE LAW OF TORT 685 (Leed Elsevier, 2002).

[50] Hedley Bryne v. Hellers Partners, [1964] AC 465, [1963] 2 All ER 575, HL. *See also, Spring v Guardian Assurance,* BGE 111 II 471; *Spring v Guardian Assurance* [1995] 2 AC 296, [1994] 3 All ER 129, HL; *White v Jones* [1995] 2 AC 207, [1995] 1 All ER 691, HL; *Henderson v Merrett Syndicates* [1995] 2 AC 145, [1994] 3 All ER 506, HL.

[51] White v Jones, [1995] 2 AC 207.

Fault-based liability, taking into account the circumstances, is able to approach the liability of data suppliers, end-users and third parties. The elements of fault-based liability, foreseeability of the harm, reasonableness of the defendant's behavior, and professional negligence, are highly relevant to determining cases associated with remote sensing. They make it possible to distinguish cases concerning the intentional misuse and misinterpretation of data from unintentional ones. It can further assist the court to determine whether such unintentional misinterpretation and other operations leading to the inaccuracy of the resulting products were within or beyond the reasonable limit under the circumstances in particular. The element of professional negligence would be useful in adjusting to different settings of disputing parties more effectively. It would be of help in reaching a more favorable decision for the end-user who is a less knowledgeable individual as opposed to the data generators that are specialized in the remote sensing operations. In these ways, the consideration of elements determining the fault of the responsible party adopted in the fault-based liability approach is suited to apply to cases involving remote sensing and helps settle potential claims more effectively.

CONCLUSIONS AND RECOMMENDATIONS

Today, the role of legal framework is increasingly critical to make the most of remote sensing data. Insufficient standards lead to questions concerning the accessibility to and intellectual property rights of data as well as liability issues arising from the data. The need for improvement in this area has become urgent.

Data policies developed differently by each data generator, affecting the degrees of accessibility to and the utilization of data by end-users and third parties. We can conclude that it is difficult to achieve a single data policy as a whole, yet certain guidelines need to be set to facilitate easier access and the wide use of data for public service without burdening the commercial operations.

It is recommended that the public services should have a common access and pricing policy, whereas commercial services

should be left unregulated. Data should be made available under a single gateway free of charge to the public for unlimited use by any number of users without case-by-case authorization. However, both categories apply the common intellectual property standard although some rights of data generators need to be compromised for the public services. Particularly, the conditions for protection for value added products need to be clarified and adjustment with the national law concerning the intellectual property rights may be necessary.

At present, the issue of liability is not sufficiently dealt with anywhere: not under the current legal framework surrounding remote sensing and not in contractual agreements. Most fundamentally, the gap exists between the tendency towards unenforceability of liability disclaimers in certain cases and practice of satellite data suppliers who wish to waive any potential liability. The examination of cases clearly raise doubts as to the enforceability of a liability disclaimer in cases of 1) exoneration with respect to third parties and 2) liability disclaimers with respect to the party with unequal bargaining power. It is clear that liability has to be consulted within a broader framework of tort

A single regime should cover the damage arising from remote sensing both for contractual and third party loss. The fault based liability should be adopted for all potential defendants and cover all settings: contractual relations, relationships between data suppliers and third parties, and between third parties. However, there should be different degrees of the duty of care expected depending on the bargaining power of the alleged party vis-à-vis the claimant party. The regime should allow the exoneration of liability in commercial settings, but should not allow the exoneration when an intentional tort or gross negligence has occurred. The key elements determining the fault will be the foreseeability of the harm, the reasonableness of the alleged party causing the damage, and equal bargaining power of the concerned parties.

If the proposed recommendations are applied, then the current situation will be much improved: misinterpretation will be minimized and misuse discouraged whilst the potential claims could be addressed more robustly. The recommendations ra-

tionalize the data access and enhance confidence in the wider use of EO data for critical applications. This would provide the clarity and improvement needed for the full exploitation of EO data in support of disaster management and protection of the environment.

FIRST LICENCE ISSUED UNDER CANADA'S REMOTE SENSING SATELLITE LEGISLATION

Bruce W. Mann[*]

BACKGROUND

Since the launch of the first *RADARSAT* satellite in 1995, the Canadian Space Agency (CSA) has been responsible for the collection, processing, and delivery of its synthetic aperture radar (SAR) satellite imagery worldwide, including sales and distribution through private sector partners.

However, when CSA announced in February 1998, that they had awarded a contract to MacDonald, Dettwiler and Associates (MDA) to construct, own and manage a new, more powerful SAR satellite, *RADARSAT-2*, it became apparent that regulation of the commercial satellite operator would be required to protect Canada's national security and international affairs interests, as well as public interests in the environment and safety of persons and property.

On June 16, 2000 the Agreement between the Government of Canada and the Government of the United States of America concerning the Operation of Commercial Remote Sensing Satellite Systems[1] (2000 Canada-US IGA) was signed, facilitating the export of United States technology, with the *RADARSAT-2* satellite specifically in mind. A very clear expectation was established in the first clause of the Agreement about the nature of legislation that would be enacted in Canada:

> The parties agree to ensure that such commercial remote sensing satellite systems will be controlled by each Party in a com-

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[1] Agreement between the Government of Canada and the Government of the United States of America concerning the Operation of Commercial Remote Sensing Satellite Systems, U.S.-Can., June 16, 2000, 2000 Can. T.S. No. 2000/14 [hereinafter 2000 Canada-US IGA].